WATERSHED PLANNING IN A NPDES PHASE II COMMUNITY

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Abstract. With the impending NPDES Phase II permit regulations; many communities are seeking ways to meet the six minimum controls that must be implemented with the permit. The City of Griffin has implemented and continues to implement traditional and innovative programs to meet the challenges of the NPDES permit and loading restrictions due to TMDL requirements. It is the intention of the City of Griffin to provide a model for NPDES implementation to small and medium sized communities having to apply for permit coverage.

INTRODUCTION

With the issuance of the final National Pollution Discharge Elimination System (NPDES) Phase II Stormwater Regulations, stormwater management has become a federally mandated regulatory issue that over 50 small to medium sized communities within the State of Georgia are beginning to address. Previously, the Phase I NPDES Stormwater Regulations mandated that large urban communities such as Atlanta, Columbus, and Savannah comply with applicable regulatory requirements. The primary focus of the Phase II Stormwater regulations is to mandate small to medium sized communities to formulate and implement stormwater programs that address adverse impacts associated with non-point source pollution within their jurisdictional watersheds.

Created in 1997, the City of Griffin's Stormwater Program (the Program) is considered by many to be the state of Georgia's most progressive stormwater program in scope and innovation. Seeking to accomplish seven primary goals and maintain compliance with State and Federal regulations concerning watershed protection and regulation, the Stormwater Department (the Department) has been charged with:

- Protect the health and life of the City Residents
- Minimize property losses
- Enhance floodplain use
- Ensure a functional drainage system
- Protect and enhance the environment
- Encourage aesthetics
- Guide development
- Manage watershed from a holistic approach

The Program will also provide mechanisms for remediation and compliance with regulatory issues facing small to medium municipalities. The City of Griffin (the City) is designated for Phase II permit coverage as a small municipal separate storm sewer system (MS4s), outside of an Urbanized Area, with a population greater than 10,000 persons and density greater than 1,000 persons per square mile. Municipalities that are so designated must apply for MS4 permit coverage by March 10, 2003. The Department will ensure that the City is able to meet and exceed the six minimum controls that must be included in the Phase II permit. These controls consist of:

- Public Education Outreach
- Public Participation / Involvement
- Illicit Discharge Detection Elimination
- Construction Site Runoff Control
- Post Construction Runoff Control
- Pollution Prevention / Good Housekeeping

WATERSHED OVERVIEW

As do many cities and towns of Georgia, Griffin sits astride a major watershed boundary. Typically, railroad development has dictated town locations and the railroad have historically been routed where bridge requirements are minimized. Thus, railroad routes have traditionally followed drainage divides.

Originally situated around a railroad junction, Griffin has developed along the divide between the Flint River system to the west and the Ocmulgee River system to the east. Six watersheds within the City of Griffin are contained within these two river systems. Draining eventually to the Ocmulgee River is the Cabin Creek Watershed. Draining eventually to the

Flint River are the Heads Creek, Shoal Creek, Wasp Creek, Honey Bee Creek, and the Potato Creek watersheds. The City of Griffin lies at the headwaters of all these creeks.

Several of the streams are found on what is commonly referred to as the 303(d) list, the Georgia list of waters required by Section 303(d) of the Federal Clean Water Act (CWA). Potato Creek, Cabin Creek, and Heads Creek are on the list, with Potato and Cabin as listed stream segments within the City of Griffin.

PROGRAM OVERVIEW

It is the intention of the City to continue in the establishment of a comprehensive program to manage, restore, and maintain the watersheds within its jurisdiction. Many of the components within this plan will also satisfy the requirements of the previously mentioned NPDES Phase II Permit, as well as other regulatory and environmental concerns. The City intends to use this plan and its resultant programs to help manage the impacts of economic growth with sound environmental science and engineering. The focus of this discussion will be to examine the major components of this management program.

FUNDING

Paramount to creating a successful program and achieving the goals set forth by the City's citizens and elected officials, a stable funding source had to be established to implement the programs needed. Utilizing examples set in Florida, the City investigated the implementation of a Stormwater Utility. The Stormwater Utility, like a sewer or water supply utility, is user oriented with costs being allocated based on services received (Debo, 1995). Another way of saying this is, "you only pay for the demand you put on the system". In 1997, the City implemented the Stormwater Utility (the Utility) and is currently generating approximately $1.2 million dollars a year in revenue for use in the Stormwater Program.

While the Utility is able to generate a stable and significant source of operating revenue for the Department, the Utility allows the City to also acquire alternative funding sources that aid in the funding of more capital-intensive projects. As of January 2001, the Department had been awarded approximately $2.6 million dollars in low interest loans through the Georgia Environmental Facilities Authority and approximately $1.7 million in various grant programs.

DATA ACQUISITION

Following implementation of the program and funding source, the Department implemented a comprehensive monitoring program to assess the state and extent of its drainage infrastructure. The initial task that the Department undertook was a complete inventory of the man-made storm drain infrastructure within the City. While several communities have begun or completed a GIS survey of the storm drain systems within their jurisdictions, the Department created a system that is both comprehensive and extremely user-friendly in use and maintenance. The scope of the survey covered all major and minor collection systems within the City, including public and privately owned drainage systems. In order to provide for a more user-friendly system the inventory is maintained on an easy to use Microsoft Excel Spreadsheet and is updated to Arcview with the press of a button. Customized scripts written specifically for the Department accomplish this process.

In addition to inventorying the drainage system within the City, the Department has undertaken an effort to quantify water quality within each of the City's watersheds. This effort is being accomplished in cooperation with watershed studies being conducted over a period of three years. Periodic testing of levels of Nitrogen, Metals, and Organics are utilized to aid in determining event mean concentrations during storm events and back ground levels during dry weather. Additionally, weekly measurements of temperature, dissolved oxygen, pH, turbidity, and specific conductivity, Total Suspended Solids (TSS) and Fecal Coliform are utilized to develop specific trends in watershed health.

Finally, as part of the Program's ongoing data collection effort, the Department has purchased several American Sigma AV Flow meters and Auto Samplers. The flow meters are utilized in projects involving flood control and water quality mitigation to determine field parameters to measure a project's success. Additionally, the data gathered from the flow meters is used to aid in calibration of hydrologic and hydraulic models. Utilizing Auto Samplers, the Department is able to promptly sample stormwater runoff in areas where manual sampling is inaccessible or impractical.

ENGINEERING MODELING

Following completion of the GIS stormwater drainage inventory, the Department began a three year

series of engineering studies aimed at assessing the health of the watershed as well as determining the extents of the urbanized flood plain. These studies consist of the Hydrologic and Hydraulic (H&H) studies and Watershed Assessments.

The primary purpose of the H&H study is to evaluate flooding and erosion problems and to analyze and recommend potential corrective measures to address these issues. While the primary purpose of the Assessment is to identify environmental problems related to non-point source pollution and to analyze and make general recommendations concerning the identified problems. Both studies have "cross-over" issues that impact both components and thus require integration of potential remedial solutions.

The H&H Study consists primarily of tasks involving:

- Channel Cross-Section Surveys – The major stream reaches within each watershed are field surveyed to provide the basis for hydraulic analysis.
- Hydrologic and Hydraulic Modeling –Using standard Army Corps of Engineers software, HEC-1 and HEC-RAS, flood flows and flood elevations are determined throughout the watershed. These models are then integrated with the GIS for efficient mapping of pertinent flooding variables.
- Drainage System Evaluation – Utilizing data gathered in the modeling effort, the drainage conveyance system within the watershed is evaluated for two conditions: flooding and erosion under existing land-use and also under future land-use.

The Watershed Assessment consists primarily of tasks involving:

- Data Integration and Analysis – The water quality data gathered in the data collection effort will be compiled and integrated to a GIS for review, analysis, and presentation.
- Modeling – The EPA BASINS software will be utilized to model existing and proposed conditions, and to provide a foundation for Total Maximum Daily Load formulation.

CAPITAL IMPROVEMENTS PROGRAM

After the initial data collection efforts are completed and the data is utilized in developing the models to evaluate water quality, flood plain location, infrastructure integrity, and capacity, the program is able to move into the evaluation of proactive response scenarios for flooding and environmental "hot spots".

Traditionally, citizens have identified flooding problems after a major storm event such as Tropical Storm Alberto. Under this system of stormwater management, the Department would have very little knowledge of how policy level decisions at the planning levels can effect the safe and efficient operation of their drainage systems. By utilizing H&H models like HEC-1 and HEC-RAS in conjunction with GIS, the Department is able to model the effects of large scale developments will have on flooding and how best to manage runoff in order to maximize use and longevity of the downstream drainage systems. Additionally, these models will allow the Department to simulate hypothetical storm events and discover existing problem areas before the actual flood occurs. By utilizing this data, the Department can effectively plan and execute a systematic program of upgrading problem culverts and systems in an organized manner, thus stretching available financial resource to maximum potential.

While H&H modeling allows the Department to gain a grasp on how its system will function in large storm events and where development would encroach on the 100-year flood plain, environmental modeling revels a knowledge of how development will effect the health of the watershed. Additionally, through continuous water quality monitoring and simulation in models like BASINS, the Department is able to utilize the models to assess the City's contributions of pollutants of concern to receiving waters. This in turn is used to evaluate the need for Best Management Practices (BMPs) to be used in controlling pollutants in meeting Total Maximum Daily Load (TMDL) restrictions.

In summary, the goal of the Capital Improvements Program is to effectively plan, construct, and manage the needed components of the City's drainage system in the safest, most efficient and fiscally sound manner as possible.

RESEARCH & DEVELOPMENT

Onsite stormwater management controls alone do not fully protect against the cumulative impacts on receiving waters. Therefore, stormwater management also needs to occur at the watershed level in a manner that integrates and is consistent with the site level approach. A variety of structural and non-structural BMPs will be applied. The stormwater utility is in fact a non-structural BMP since it provides a funding

mechanism for other applied watershed management options.

As stated earlier, the Utility is able to provide a stable and equitable source of funds and has been a key to the success of the Department's ability to evaluate and procure alternative funding sources. As such, the Department has been able to implement several Research and Development projects within the City. Such projects include the North Griffin Regional Detention Pond Non-Point Source Mitigation Project to study the effectiveness wetlands filtration technology in a regional detention pond and the TEA-21 Highway Non-Point Source Mitigation Project to study the effectiveness of compact BMPs on highway runoff and how these controls can effect watershed health. In addition to these projects, the City is also planning several other projects to look at controls for developers.

The Department considers itself a leader in the small to medium sized communities in dealing with stormwater related issues. The Department conducts these projects not only to solve its own problems, but also to provide valuable data for other communities to use in their programs where the financial resources may not exist to perform the necessary research to determine a project's effectiveness or applicability.

REGULATORY

As the City proceeds with data collection, modeling and capital improvement planning and implementation, it is imperative that the groups who live and work within the City's watersheds use the resources of the City in a responsible manner such that the investments made are not rendered useless. To help insure that this does not happen, the Department and other departments within the City have and continue to develop programs and policies to help guide use of the City's watersheds.

The most effective program in the Department's arsenal of tools is the Erosion and Sedimentation (E&S) Control inspection program. On a daily basis, Department personnel visit development sites within the City and inspect erosion and sediment controls on site to control soil from eroding into nearby streams and thereby killing aquatic plants and animals. In addition to the E&S inspection program, the Department is instituting an Illicit Discharge Detection and Elimination program. It is the intention of the Department to substantially reduce the amount of pollutants being discharged into creeks due to preventable causes through these programs.

PUBLIC INFORMATION & EDUCATION

While regulatory programs and capital improvement projects will greatly aid in reducing flooding and pollution in the City's creeks, ultimately the responsibility for clean water and effective management of the City's watersheds will lie in educating the public on water resource conservation. In order to provide the public an opportunity to learn about and influence the Program goals and activities, the Department has initiated a comprehensive Public Information and Education (PI&E) program. Through various media outlets, the Department is able to work with various stakeholder groups to educate and guide these groups through water resource conservation and responsible use.

Serving as the backbone of the PI&E program, the Department's website (www.Griffinstorm.com) is the central distribution point for information and resources available through the Department. The Department is able to publish documents, such as the Stormwater Master Plan and the Stormwater Design Manual, to guide developers in approved design methods of stormwater management, applicable ordinances and research results on various R&D projects. Additionally, the website serves as a central location for links to various other governmental and environmental websites.

The Department also uses the local newspaper to publish a yearly status update on the Program. Finally, the Department publishes several papers a year at various conferences and in industry publications to disseminate information on program achievements to other communities and professionals.

WATERSHED PROTECTION

The ultimate goal of the Program is to provide the City of Griffin with technically sound and defensible recommendations for making informed watershed management decisions, through the balancing of economic growth, and protection of the long-term health of the City's water resources. As studies are completed and data is continually gathered, the Stormwater Master Plan will be updated to provide for watershed specific goals and achievements.

CONCLUSION

As stated earlier, one of the primary goals of the Program is to provide a mechanism to ensure that the City is able to meet and exceed the six minimum

controls that must be included in the Phase II permit. Through the Department's PI&E program and R&D projects the Department believes that it will meet and exceed the first two minimum controls of Public Education Outreach and Public Participation/ Involvement. Additionally, through mapping of the Storm Drainage Inventory on a GIS platform and through its Illicit Discharge Detection and Inspection program the Department will meet the requirements of Illicit Discharge Detection Elimination control. Through the already established E&S inspection program the Department has met the requirements of the Construction Site Runoff Control. Post Construction Runoff Control is accomplished through development requirements developed as a result of watershed management strategies included in the engineering modeling and capital improvements programs. Finally, Pollution Prevention / Good Housekeeping is accomplished through tasks developed in the Watershed Protection Program such as training of staff and cleaning using the Department's cleaning equipment.

While this discussion is by no means a comprehensive review of the Department's efforts to manage its watersheds, the programs described herein serve as an example for other communities to consider for their stormwater management programs.